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Mr. Chairman and Members of the Subcommittee, thank you for the invitation to participate in today's hearing on energy issues and U.S. agriculture. I will first provide some background information on the general role of energy in U.S. agriculture and then discuss the more specific effects of higher energy prices on U.S. agriculture. In general, the farm economy appears to be responding efficiently and in a normal market-oriented way to increased energy prices. Some farmers are changing what they produce and how they produce by switching to alternative commodities and production inputs. Most producers are facing higher costs of production and reduced incomes due to higher energy prices. Production costs are also up for food processing and distribution, but very little effect is expected on retail food prices and the supply of food.

Background on the Role of Energy in U.S. Agriculture

Overall energy use. U.S. farms and ranches directly purchase diesel fuel, gasoline, natural gas, liquid petroleum (LP) gas and electricity. Farmers also use significant amounts of energy indirectly through other production inputs, such as commercial fertilizers and pesticides. U.S. agriculture is a relatively intense user of energy, as indicated by comparing U.S. agriculture's share of the energy used by all sectors of the U.S. economy with U.S. agriculture's share of U.S. Gross Domestic Product (GDP). Both direct and indirect energy consumption for farm production required 1.8 quadrillion British thermal units (BTUs) in 1998, the most recent year of complete data, or about 2 percent of total energy consumed in the United States. In that year, U.S. agricultural production accounted for less than 1 percent of U.S. GDP.

U.S. agriculture has become much more energy efficient during the past two decades. Energy use grew during the 1960s and 1970s, peaking at 2.2 quadrillion BTUs in 1978. High

energy prices from the early 1970s and through 1982 led farmers to become more energy efficient. Many producers switched from gasoline-powered to more fuel-efficient diesel-powered engines, adopted conservation tillage practices, shifted to larger machines, and adopted energy-saving methods of crop drying and irrigation. As a result, farmers reduced direct energy use by 41 percent from 1978 to 1998, while productivity grew sharply.

Shift to diesel. The substitution of diesel fuel for gasoline has been perhaps the most significant shift in energy use. As farm size grew, producers purchased more energy-efficient, higher horsepower, diesel-powered tractors and self-propelled equipment. Gasoline use dropped from 42 percent of total direct and indirect energy used on farms in 1965 to only 8 percent in 1998, while diesel's share of total energy used on farms rose from 13 percent to 26 percent.

Adoption of conservation tillage. Increased conservation tillage also has reduced fuel use on U.S. farms, as it requires less energy than conventional tillage that involves extensive field preparation prior to planting. Adoption of conservation tillage on major field crops, such as corn and soybeans, began to increase significantly in the 1980s but has stabilized in recent years.

Fertilizer use. Commercial fertilizer–particularly nitrogen–is the most energy intensive farm input, accounting for about 45 percent of total energy required in farm production in 1998. Fertilizer consumption grew throughout the 1960s and 1970s, peaking at 23.7 million nutrient tons in 1981. Since the mid-1980s, fertilizer use has remained relatively stable, ranging from about 19 million tons to 22 million tons from 1984 to 1998. Use declined from its peak level in 1981 because of fewer planted acres and stable application rates.

Pesticide use. Manufactured pesticides, including herbicides, insecticides and fungicides, also require large amounts of energy. Pesticides used on major crops increased rapidly in the 1960s and 1970s, rising from 215 million pounds in 1964 to 572 million pounds in 1982. Pesticide use declined between 1982 and 1990, as commodity prices fell and large amounts of acreage were taken out of production under Federal programs. Since 1990, pesticide use has been growing, but at much slower rate than the 1960-80 period.

Energy use by commodity. Direct energy expenditures as a share of total farm cash production expenditures may be used as a measure of energy intensity for various commodities. Energy expenditures for liquid fuels–diesel, gasoline, and LP gas–and electricity vary by commodity. Poultry, which requires large amounts of LP gas and electricity for controlling the temperature of indoor facilities has the highest energy expenditure ratio. Crops that require drying and irrigation also have relatively high energy expense ratios. Dryers and irrigation equipment use various forms of energy, including electricity, natural gas, and LP gas.

Recent energy price variability. The prices that farmers pay for fuels, including gasoline, diesel, LP gas, and natural gas, are typically more volatile than other farm input prices, such as fertilizer, machinery or general supplies. Over the past 8 years, the index of prices paid by farmers for fuels price reached its lowest point in February 1999 at about 65 percent of the 1990-92 average price. Since that time, the price paid for fuels has more than doubled, reaching a high in November 2000 of 155 percent of the 1990-92 average. Fuel prices have dropped about 10 percent since November, with the index of prices paid for March 2001 at 140 percent of the 1990-92 level. Average monthly diesel prices paid by farmers have increased the most since the summer of 1999, followed by gasoline prices, and then LP prices. Increases in LP prices have been particularly noticeable in recent months, as the index of prices paid for LP increased by 75 percent from October 2000 to March 2001. USDA does not collect data on priced paid by farmers for natural gas; however, natural gas market prices have been rising since the summer of 1999. In December 2000, the price industrial consumers paid was $6.49 per thousand cubic feet, up from $3.05 the previous December. Fertilizer prices have increased steadily over the past decade, with the recent increases in natural gas prices contributing sharp increases to fertilizer prices. Pesticide prices have remained steady.

Higher Energy Prices and the Effects on U.S. Agriculture

Natural gas and LPG prices. Spot prices for natural gas in January 2001 averaged nearly four times the year earlier level. Natural gas prices have been declining since early January, but remain about twice the level of a year earlier. Futures market contracts for the

remainder of 2001 suggest little change in natural gas prices from recent levels. Such increases raise irrigation, grain drying and heating costs and raise production costs of other farm inputs that use natural gas in their production, principally fertilizer.

Since liquid petroleum gases (LPG), especially propane, are highly correlated with natural gas and oil prices, farm expenses for these fuels have been increasing as well. Propane production is a by-product of natural gas processing and petroleum refining and production is therefore is quite insensitive to changing propane prices. The peak demand season for propane is in the winter when it is used for residential heating, and it is an important heating source in rural areas. Price spikes can occur if colder-than-normal weather occurring early in the winter causes inventories to be drawn down quicker than usual, a factor in the increase in prices paid by farmers last winter, along with rising natural gas prices.

The higher natural gas and LPG prices have been particularly problematic for agricultural operations that rely heavily on heating, drying and irrigation. Irrigation pumps are fueled by natural gas, LPG, diesel fuel and electricity, but the most common fuel sources are natural gas, especially in the plains states, and electricity, especially in the western states. Higher natural gas prices are also playing a role in western electricity problems, although there are a number of other factors involved. In recent years there has been a rapidly growing dependence on natural gas for electric power generation, adding to the demand for natural gas associated with the growth in the U. S. economy.

Higher natural gas prices increase the cost of producing anhydrous ammonia, which is the main ingredient of nitrogen fertilizer in the United States. Natural gas accounts for 70-90 percent of the cost of producing ammonia. Last year as natural gas prices rose to record levels, many nitrogen fertilizer producers stopped production, and by January 2001, ammonia production had dropped to an estimated 50 percent of capacity. Recent data show that ammonia production year-to-date is 21 percent below a year earlier. Following the rapid decline in natural gas prices from the peak in January, ammonia production has returned to an estimated 80 percent of capacity.

The decline in U.S. nitrogen production caused nitrogen fertilizer prices to increase. Many crops depend on nitrogen to achieve high yields, and U.S. farmers used over 12 million tons of nitrogen in various forms in 1999. Nitrogen fertilizer use varies widely by crop, for example, vegetables and wine grapes are among the most nitrogen dependent crops, while soybeans require very little. In late January, the spot ammonia price in the corn belt reached $360 per ton. Prices have declined since, but are still almost double last year's level. The Green Market average price for anhydrous ammonia in the Midwest as of April 23 was $338 per ton. Other fertilizer prices, such as potash and phosphate are largely unchanged from a year ago.

While nitrogen producers are working to increase production as natural gas prices have declined, the shortfall is being supplemented by imports and inventories. Imports are expected to reach record levels this year. From July 2000-January 2001, imports of nitrogen fertilizer were 28 percent above the same period last year, excluding certain imports from Russia and the Ukraine.

In order to gauge potential nitrogen supply problems for farmers this spring, USDA surveyed county extension agents in late April to determine whether farmers were having problems obtaining nitrogen fertilizer. Agents were asked, what percent of normal nitrogen fertilizer supplies are available to producers in your area? Most of the nation reported supply availability as 95-100 percent of normal, and no state reported less than 91 percent of normal. This was an improvement compared with late March's report when a number of states reported between 70 and 90 percent of normal. This information and reports from producers and the fertilizer industry suggest that nitrogen is generally available for spring-planted crops.

Fuel prices. Last year's spike in fuel prices helped push total farm production expenses to an estimated $200 billion in 2000, 4 percent over 1999, and the first significant rise since 1997. Farm direct fuel expenditures rose to an estimated $8.1 billion in 2000, up $2.3 billion or 40 percent from 1999, accounting for about 4 percent of total farm production expenditures, the highest share since 1986. Farm fuel expenditures are expected to increase in 2001.

Farm income. Farm expenditures for fuels and oils, electricity, fertilizer and pesticides increased an estimated $2.9 billion in 2000. This increase in costs, combined with low commodity prices, reduced net returns from the market for most farm commodities. However, with supplemental assistance, direct government payments reached a record high $22.1 billion in 2000, at least offsetting the effects of higher production costs on net returns for many commodities. For some other commodities, such as livestock, higher market returns could have offset some energy cost increases. Net cash farm income for U.S. agriculture is estimated at $56.4 billion in 2000, up from $54.6 billion in 1999. Of course, not all commodities were covered by increased direct government payments or market income.

The Department's current forecast of U.S. farm income for 2001, including forecasts of farmers' production expenditures on energy, was released in January and is updated quarterly. The January forecast placed 2001 farm expenditures on fuels and oils, electricity, fertilizer and pesticides at $30.9 billion, up $700 million from 2000 and net cash farm income down by about 10 percent. Based on developments since January, it now appears that farm spending on farm energy inputs will increase by $2 to 3 billion, with higher fertilizer expenses accounting for much of the increase. The Department will release an updated farm income forecast that will take into account these higher energy costs, as well as other changes, in late May.

What farmers are doing. Farmers are limited in what they can do to mitigate the effects of higher energy prices, although some options are available. Where possible, some producers may be able to employ different production strategies, such as reducing field operations by switching from conventional tillage practices to reduced till; adjusting fertilizer application rates; changing the timing of fertilizer application to better coincide with available supplies; or using more animal manure and green fertilizer. Nitrogen application rates are such that each added pound of nitrogen changes the expected crop yield very little for many producers. Consequently, the increased cost of nitrogen due to higher nitrogen prices will exceed the market value of the increased production generated by the last few pounds of nitrogen applied. This market signal is

expected to cause many producers to trim application rates in 2001, which will also help bring the demand for nitrogen in line with the reduced production.

Some producers may also have been able to switch to crops which require less energy inputs. Last year, there did not appear to be much adjustment due to higher fuel prices. There were more corn acres than expected and acreage planted to the major crops was up, from 330 million acres in 1999 to 331 million in 2000. However, more adjustment appears to be taking place this year. USDA's March survey of farmers' planting intentions for the 2001 crops indicated producers plan to reduce nitrogen-intensive corn acreage by 2.9 million acres or 4 percent. Acreages of the 15 principal crops were indicated to be down 3.6 million acres or 1.4 percent.

Higher energy costs in the west are also of particular concern to horticultural producers. U.S. horticulture accounts for 40 percent of total U.S. crop value and over 20 percent of all U.S. agricultural exports. California alone produces half of all U.S. horticultural products and accounts for over half of U.S. horticultural exports. Many horticultural producers in California face little flexibility in adjusting to the higher costs, as over 60 percent of production area is planted in orchards and vineyards. Aside from the expected higher costs of providing water and fertilizers to grow these high-value perennial crops, over half of total California horticultural production requires post-harvest processing.

Producers appear to be cutting back on production of some high-value crops in the face of restricted energy use and water availability in 2001. For example, in the Pacific Northwest onion producers planted less acreage than expected given recent improvements in market prices, citing power companies offering energy buy backs and concerns over water availability. Production of vegetables for canning, freezing, and drying in California and the Pacific Northwest is forecast lower partly due to similar concerns. And, sugarbeet processors in Idaho report they are uncertain as to the final acreage being planted because of energy buyback offers.

Another strategy some farmers may be able to use to limit the effect of higher fuel prices if they own storage tanks is to purchase fuel when prices periodically pull back and store it for

later use. This may allow them to avoid seasonal price spikes, for example, that occur in the summer when gasoline demand traditionally goes up and in the early winter when heating oil demand increases diesel prices. Some producers may try to reduce price risk by hedging in the futures markets or entering into longer term contracts for energy-based inputs.

Over the long term, farmers could replace old and energy inefficient farm machinery with more energy efficient equipment, similar to what occurred following the energy price hikes of the 1970s through early 1980s. In addition, more advanced farming practices could be adopted, such as precision farming that optimizes the use of chemicals and fertilizers. New seed varieties are also reducing chemical requirements. New seed varieties and larger combines can also postpone harvest fostering field drying and reducing drying costs.

What is happening post farm. The effects of higher energy prices on off-the-farm activities are also affecting producers. Higher diesel fuel prices are increasing the costs of transporting agricultural commodities from farm to consumer, and higher natural gas and electricity prices are increasing processing and storage costs. Increases in transportation costs increase the basis–the difference between prices at the farm and at terminal markets–and higher processing and distribution costs can reduce the price buyers bid for farm commodities. As a result, farmers could receive lower prices than otherwise for their products.

The cost of marketing U.S. foods has increased considerably over the years, mainly because of rising costs of labor, transportation, food packaging materials, and other inputs used in marketing, and also because of the increase in convenience and service provided with the food. Processing and marketing costs account for about 80 percent of what consumers spend for domestic farm food, not including imported foods. The remaining 20 percent represents what farmers receive. Components of post-farm costs are labor, packaging, transportation, energy, advertising, depreciation, rent, interest, and profits. Higher energy prices increase energy costs associated with food processing and retailing as well as the cost of transporting food. In 1998, energy accounted for 3.5 percent and transportation 4 percent of post-farm food marketing costs of food. Labor accounted for 39 percent and farm value of food accounted for 20 percent.

Over time, much of the increase food production and distribution costs due to higher energy prices will likely be passed on largely to consumers through higher retail prices. In 2001, the all-food CPI is forecast to increase 2.5 percent, up from 2.3 percent in 2000. Thus, higher energy prices at this point do not appear to be having much effect on retail food prices. Last year's food CPI rose slightly, mainly the result of higher meat prices due to tighter meat markets. This year's modest increase above last year is expected to reflect continuing meat as well as vegetable price increases.

Effects of Higher Energy Prices on Energy-producing Agriculture

Higher energy prices and the U.S. dependence on imported oil highlights the great potential of U.S. agriculture to help solve the nation's energy problems. Crops, crop residues, and forest residues, as well as energy crops planted on idle or marginal crop land, could be converted to various forms of energy, such as ethanol, biodiesel, biopower, and biochemicals. Ethanol from grains now accounts for almost all of U.S. biofuel production. In 2000, more than 1.6 billion gallons of ethanol were produced by 55 ethanol plants located in 18 States. This year, production is projected to increase to 1.7 billion gallons. Total U.S. production capacity is expanding, with another 125 million gallons estimated to be under construction and over 600 million gallons in various stages of planning. Research efforts also continue to seek to improve the conversion of cellulosic materials, such as grass and wood, to ethanol. According to Department of Energy projections, cellulosic ethanol production could increase to about 250 million gallons by 2010.

Because ethanol only accounts for 1.3 percent of the U.S. gasoline supply, its price is determined by the prices of gasoline, other oxygenates, and octane. Consequently, as energy prices, including MTBE increased this past year, the price of ethanol also increased from $1.19 per gallon in February 2000 to $1.63 in February 2001. The net corn cost, which is the price of corn, minus the price of coproducts, divided by the number of gallons of ethanol produced per bushel of corn, for the average wet mill was $0.36 per gallon in 1999. The net corn cost

averaged $0.42 during 2000. For 2001, assuming average weather from here on, net corn costs for ethanol plants are expected to remain about the same as last year. Stable corn price combined with higher ethanol prices are expected to lead to higher ethanol production in 2001.

USDA Energy Activities

The nation's energy problems are a top priority of the administration. The President created the Cabinet-level Energy Policy Development Group, chaired by the Vice President, to develop recommendations for addressing the nation's energy supply and demand imbalances. Secretary Veneman is a member of the Group and has brought agriculture-related issues to the attention of the Group. The Group's recommendations are expected to be released later this month.

USDA is also helping to address energy problems through our own programs. For example, the Department has joined with other Federal agencies in response to the President's directive to ensure that permit reviews and siting issues for new electricity generation in California are dealt with quickly.

USDA also announced the Commodity Credit Corporation Bioenergy Program for FY 2001 and FY 2002 to promote increased production of ethanol and biodiesel. This is a two-year program funded at $150 million per year to share the costs of feedstocks purchased for ethanol and biodiesel production. The cost-share assistance only applies to production increases above the previous year's level. For FY 2001, ethanol producers signed up to produce an additional 246 million gallons and biodiesel producers signed up to produce an added 36 million gallons. This program will expand the biofuel production capacity and help ensure available ethanol capacity to meet oxygen and fuel volume needs as MTBE use is phased down.

USDA has also implemented Section 769 of the Agriculture, Rural Development, Food and Drug Administration and Related Agencies Appropriations Act, 2000, which authorized Conservation Reserve Program (CRP) land for pilot biomass projects. Under this provision, Secretary Veneman last month approved four projects for Iowa, Minnesota, New York and Pennsylvania. These projects will produce electricity using grasses (Iowa), hybrid poplar trees

(Minnesota), willows and switchgrass (NewYork) and switchgrass (Pennsylvania). The program requires that all land subject to CRP contracts cannot be harvested for biomass more than once every other year; not more than 25 percent of the total acreage enrolled in any crop reporting district may be harvested in any year; and participants in a project must agree to a 25-percent reduction in their normal CRP annual rental payment for each year in which the acreage is harvested.

Finally, USDA has an ongoing program of research to improve the economics of energy production from agricultural materials. Our FY 2002 budget request proposes $82 million for discretionary spending on biobased products and bioenergy research and related programs, up from $80 million in 2001 and $72 million in 2000. In addition to new efforts to overcome the technical barriers to converting biomass to bioenergy, USDA will be working with other Federal agencies to improve coordination of government programs with universities, private sector companies and environmental organizations. One vehicle for improving coordination will be continued implementation of the Biomass Research and Development Act of 2000 that creates a structure led by USDA and the Department of Energy to coordinate Federal biomass research activities and develop more effective research plans.

We expect our programs to be important steps in the continuing effort to realize the potential of U.S. agriculture to help meet the U.S. demand for clean, affordable energy.

That completes my statement Mr. Chairman and I would be pleased to respond to questions.